* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]About an exposure device, an exposure mask, an exposure method, a display, and electronic parts, or this invention mainly reduces the pattern defect of a photosensitive material, it relates to the art for losing and raising productive efficiency and the yield.
[0002]
[Description of the Prior Art]The plasma display panel (PDP;Plasma display panel) attracts attention as one of the flat display panels (FDP;Flat display panel), and can make a large-sized and thin display realizable. PDP is the display which used gaseous discharge and is mainly divided roughly into DC type and AC type. In recent years, commercial production of 30-inch class to 60-inch class AC type PDP is actively made for screen size.
[0003]The perspective view for explaining AC type PDP51 [general to drawing 25] is shown. PDP51 is divided roughly into the front substrate 51F and the back substrate 51R.
[0004]The front substrate 51F is provided with the front glass board 5, the transparent electrode 1, the mother electrode (or bus electrode) 2, the transparent dielectric layer 3, and the protective film (or cathode film) 4. In detail, the transparent electrode 1 and the mother electrode 2 are laminated in this order on the front glass board 5, and the transparent electrode 1 and the mother electrode 2 are formed in stripe shape, respectively. The transparent electrode 1 and the mother electrode 2 are covered, and the dielectric layer 3 and the protective film 4 are formed in this order on the front glass board 5.
[0005]On the other hand, the back substrate 51R is provided with the rear glass substrate 9, the write-in electrode 6, the white dielectric layer 10, the septum (or barrier rib) 7, and the fluorescent substance layer 8. In detail, the address electrode 6 of stripe shape is formed on the rear glass substrate 9, the write-in electrode 6 is covered and the dielectric layer 10 is formed on the rear glass substrate 9. The composition which comprises the rear glass substrate 9, the write-in electrode 6, and the dielectric layer 10 will be called "the substratum substrate 51Q." And the septum 7 of stripe shape is formed on the dielectric layer 10. In the plane view of the principal surface of the back substrate 51R or the rear glass substrate 9, each band-like pattern of the septum 7 and the write-in electrode 6 is located in a line by turns. The fluorescent substance layer 8 is formed on the inner surface of two or more U shape slots which the septum 7 and the dielectric layer 10 accomplish.
[0006]The front substrate 51F and the back substrate 51R are piled up so that the transparent electrode 1 (and mother electrode 2) and the write-in electrode 6 may cross (solid), and the crowning and the

protective film 4 of the septum 7 may contact again, and they are sealed in the periphery. And it fills up with discharge gas in PDP51.

[0007]In PDP51, the photolithographic method is widely used for formation of the transparent electrode 1, the mother electrode 2, the write-in electrode 6, and septum 7 grade, and the one-shot exposure method is widely used as the exposure method.

[0008]Here, formation of the septum 7 is mentioned as an example and the conventional one-shot exposure method is explained. The sectional view for explaining the manufacturing method of PDP51 using the conventional one-shot exposure method is shown in drawing 26 - drawing 29. The sandblasting method is widely used for formation of a septum, and here explains the formation method by it.

[0009]First, the layer 7A (refer to drawing 26) of the glass paste which is the material of a septum is extensively formed by the coat method, print processes, etc. on the substratum substrate 51Q. And the dry film resist 60 (here negative mold) (refer to drawing 26) which is a photosensitive material is formed by the laminating method by a laminating machine, etc. on the glass paste layer 7A.

[0010]Next, as shown in drawing 26, exposure transfer of the pattern of the exposure mask (it is also only hereafter called a "mask") 201P is collectively carried out to the dry film resist 60 with a one-shot exposure device. At this time, exposure transfer of the pattern of the whole septum 7 is carried out to the resist 60 by one exposure by the conventional manufacturing method. In the portion 61 exposed among the resist 60, while photopolymerization breaks out and this exposed part 61 becomes poorly soluble description to a developing solution, in the portion 63 which was not exposed, photopolymerization does not break out but this unexposed portion 63 becomes the description of fusibility to a developing solution. For this reason, development of the dry film resist 60 will form the portion 63 which was not exposed among the resist 60 as an exposure pattern, without only the portion 61 exposed while dissolving in the developing solution dissolving in a developing solution (refer to drawing 27).

[0011]Next, the glass paste layer 7A is formed in the pattern according to the exposure pattern of the dry film resist 60 by carrying out sandblasting, using the dry film resist 60 as a mask (refer to drawing 28). Then, the septum 7 is completed by exfoliating and calcinating the dry film resist 60 at an elevated temperature (refer to drawing 29).

[0012]If the dust 200 has adhered to the mask 201P as an exposure process is shown in drawing 26, the portion which exposing light should be shaded with the dust 200 and should be exposed essentially will be in an unexposed state. That is, the dust 200 makes the resist 60 generate the unexposed pattern defect 64 (refer to drawing 27). Such an inspection and correction of an unexposed pattern defect are made after the development of the dry film resist 60, exfoliation of the dry film resist 60, or calcination etc.

[0013]Here, the top view for explaining the conventional exposure mask 201P used for the above-mentioned conventional one-shot exposure is shown in drawing 30, and in order to explain the design of the conventional exposure mask 201 to drawing 31, the top view of the back substrate 51R after the development of the dry film resist 60 is shown. In drawing 30, shade part 201bP which shades exposing light for translucent part 201aP which can penetrate exposing light white is illustrated black in the exposure mask 201P. The mask pattern of the conventional mask 201P is designed so that the resist 60 may be exposed by the pattern of the septum 7 by one exposure.

[0014]In detail about the pattern (design pattern) of the exposed part 61 of the resist 60 corresponding to the designed pattern of the septum 7. Express the width and length of each band-like pattern as Wd and

Ld, express the pitch of a band-like pattern as Pd, and express the number of band-like patterns as Nd, and. About the exposure mask 201P, the width and length of each band-like pattern are expressed as Wm and Lm, If the pitch of a band-like pattern is expressed as Pm, the number of band-like patterns is expressed as Nm and the difference in dimension between the exposure mask 201P further produced depending on material or a process and the exposed part 61 of the resist 60 is expressed as Wo, The mask pattern of the exposure mask 201P is designed satisfy formula (1) - (4).

[0015]

Wm=Wd+Wo -- (1)

Lm=Ld+Wo -- (2)

Pm=Pd -- (3)

Nm=Nd -- (4)

Since especially exposure by the one-shot exposure method is only 1 time, the exposure mask 201P is designed so that the dry film resist 60 may be exposed by one exposure concerned by the pattern which has pattern width Wd, the pattern length Ld, pattern pitch Pd, and the number Nd of pattern arrangements.

[0016]Next, operation of the conventional exposure device which performs the above-mentioned one-shot exposure method is explained, referring to the flow chart (connected via the connectors C and D) of drawing 32 and drawing 33.

[0017]In the conventional exposure device, it positions by carrying in the mask 201P to the position of a mask stage first (alignment), and adsorbs and fixes to a mask stage after that (step ST1 P-ST3P). Next, it adsorbs and fixes to a substrate stage, after carrying in an exposure object board (substratum substrate 51Q in which the glass paste 7A and the dry film resist 60 were formed) on a substrate stage and carrying out rough positioning by a pin etc. (step ST4 P-ST 6P). Next, Measuring the interval (it is also called the following "proximity gap") of an exposure object board and the mask 201P with an optical proximity gap sensor by the Z direction drive of a substrate stage or/and a mask stage. It is set as the predetermined proximity gap set up beforehand (step ST7 P-ST 9P).

[0018]then, So that the alignment gap concerned may enter in the predetermined acceptable value set up beforehand, picturizing the alignment gap with a substrate and the mask 201P with a CCD camera in alignment exposure. The XY direction drive of a substrate stage or/and the mask stage is carried out, and alignment of a substrate and the mask 201P is carried out (step ST10 P-ST 12P). And it exposes with the light exposure set up beforehand (step ST13P). In non alignment exposure, it exposes with the light exposure set up beforehand, without performing XY alignment (step ST10 P-ST 12P) with a substrate and the mask 201P (step ST13P).

[0019]A substrate stage or/and a mask stage are returned to an initial position after exposure, and a substrate is taken out after canceling adsorption and fixation of a substrate (step ST14 P-ST 16P). If there is a substrate exposed continuously (step ST17P), from above-mentioned substrate carrying-in step ST4P to substrate taking-out step ST16P will be performed repeatedly.

[0020]

[Problem(s) to be Solved by the Invention]Now, the manufacturing process of the display represented by recent years, for example, PDP etc., requires strongly the exposure technology which can realize defect-free-izing and low-defect-izing of an exposure pattern. This demand is becoming stronger as enlargement and highly-minute-izing of the display screen of a display progress in recent years.

[0021]Also enlarging the exposure mask 201P, if the display screen of a display is enlarged, the

probability that the dust 200 will adhere to the mask 201P with enlargement of the mask 201P becomes high. If the display screen of a display becomes highly minute, the pattern of the mask 201P will carry out minuteness making. Since the size of the dust 200 which causes the unexposed pattern defect 64 (refer to drawing 27) in connection with the minuteness making of the pattern of the mask 201P also becomes smaller, the deposit efficiency of the dust which causes the unexposed pattern defect 64 also by this minuteness making becomes high. Since the dust 200 interrupts exposing light, the portion which should be exposed essentially will be in an unexposed state, and the unexposed pattern defect 64 will produce it. As a result, a manufacturing yield falls or productive efficiency falls by an inspection, correction, etc. of the unexposed pattern defect 64.

[0022]Methods of reducing the unexposed pattern defect 64 by adhesion of the dust 200 in the exposure mask 201P include some methods.

[0023]The contamination control of the exposure mask 201P is mentioned as a general method. However, since the probability of dust adhesion on the mask 201 becomes higher with enlargement, highly-minute-izing, etc. of the mask 201P as mentioned above, In order to carry out control of maintenance of the mask 201P in the state of zero defects or a low defect, advanced pure management engineering is required, and antisticking of the dust 200 by the contamination control which is the mask 201P is in a situation with difficult realization actually.

[0024]When the dust 200 cannot remove by washing etc., an exposure mask will be discarded, for example and the life of an exposure mask will contract it with the dust 200.

[0025]In alignment exposure which is exposed as a special method after carrying out alignment of the mask 201P and the exposure object board, there is a method of exposing the number of times of plurality using two or more masks 201P which have the same pattern. Since the probability that the dust 200 exists in the same part (the same coordinates) in the mask 201P of two or more sheet number is very low, the unexposed portion 63 (refer to drawing 26) by the dust 200 is canceled by exposing to each mask 201P of every using the mask 201P of two or more sheet number. However, since it is necessary to each of the mask 201P of two or more sheet number to carry out a series of processes of a substrate injection, alignment exposure, and substrate taking out, there is a problem that productive efficiency will decrease. Although this method is feasible to the alignment exposure which performs position ****** of a substrate and the mask 201P, In the non alignment exposure which does not align, there is a problem that it cannot carry out (for example, exposure process etc. of the first time when the alignment mark is not formed on the substrate). or [for this reason, / that this method of exposing the number of times of plurality using the mask 201P of two or more sheet number is not generally enforced, either] -- or it is in the situation which cannot be carried out.

[0026]This invention is made in view of this point, and can ease the contamination control of an exposure mask, A throughput higher than the case where multiple times are exposed using two or more exposure masks can be realized, and it sets it as the 1st purpose to provide the exposure device and exposure method of alignment exposure and non alignment exposure which can respond to all.

[0027]This invention can ease contamination control and sets it as the 2nd purpose to provide the exposure mask which can extend the life-span of [an exposure mask].

[0028]It sets it as the 3rd purpose to provide a display and electronic parts cheaply by realization of the 1st and 2nd purposes of the above.

[0029]

[Means for Solving the Problem]The exposure device according to claim 1 controls outgoing radiation

of exposing light from a substrate stage which supports an exposure object board which has a photosensitive material, a mask stage which supports an exposure mask, an exposure light source, and said exposure light source, and. Have a control section which controls a position of said mask stage or/ and said substrate stage, and controls a relative position of said exposure mask and said exposure object board, and said control section, Exposure control which carries out one-shot exposure transfer of the mask pattern of said exposure mask according to said exposure light source at said photosensitive material, Carry out stage position control which adjusts a relative position of said exposure mask and said exposure object board one by one, and carry out said exposure control twice [at least], and said stage position control, The specified quantity and lap control to change are included for an overlapped position in plane view of said mask pattern of said exposure mask, and said exposure object board so that said mask pattern of said exposure mask may lap with a part of exposed portion in said previous exposure control.

[0030]The exposure device according to claim 2 is the exposure device according to claim 1, and said stage position control, Proximity gap expansion control which keeps away said exposure mask and said exposure object board before said lap control, and proximity gap reduction control which brings said exposure mask and said exposure object board close after said lap control are included further.

[0031]The exposure device according to claim 3 is the exposure device according to claim 1 or 2, and said stage position control includes further alignment control which carries out alignment of said exposure mask and said exposure object board after said lap control.

[0032]The exposure mask according to claim 4 is an exposure mask for exposing a photosensitive material which an exposure object board has to a prescribed pattern, It has a mask pattern corresponding to said some of prescribed patterns, Said mask pattern is a pattern which can be exposed to said prescribed pattern about said photosensitive material by changing an overlapped position in plane view of mask pattern concerned and said exposure object board, and carrying out multiple-times operation of the exposure.

[0033]The exposure mask according to claim 5 is the exposure mask according to claim 4, and said some of said prescribed patterns are selected so that exposure shape may continue between said some of said prescribed patterns and the remaining other parts.

[0034]The exposure mask according to claim 6 is the exposure mask according to claim 4 or 5, said prescribed pattern contains a unit pattern of a predetermined number arranged repeatedly, and said some of said prescribed patterns contain a unit pattern of two or more and less than said predetermined number among said two or more unit patterns.

[0035]A step which the exposure method according to claim 7 is an exposure method which exposes a photosensitive material which an exposure object board has to a prescribed pattern using an exposure mask, and carries out one-shot exposure transfer of the mask pattern of the (a) aforementioned exposure mask at said photosensitive material, (b) A step which adjusts a relative position of said exposure mask and said exposure object board, Carry out a preparation, said step (a), and said step (b) one by one, and carry out said step (a) twice [at least], and said step (b), (b)-1) Include an overlapped position in plane view of said mask pattern of said exposure mask, and said exposure object board for the specified quantity and a step to change so that said mask pattern of said exposure mask may lap with a part of exposed portion at said previous step (a).

[0036]The exposure method according to claim 8 is the exposure method according to claim 7, and said step (b), (b)-2) a step which keeps away said exposure mask and said exposure object board before said

step (b)-1, and (b)-3 -- a step which brings said exposure mask and said exposure object board close after said step (b)-1 is included further.

[0037]the exposure method according to claim 9 is the exposure method according to claim 7 or 8 -- said step (b) -- (b)-4 -- a step which carries out alignment of said exposure mask and said exposure object board after said step (b)-1 is included further.

[0038]The exposure method according to claim 10 is the exposure method according to any one of claims 7 to 9, and the exposure mask according to any one of claims 4 to 6 is used for it as said exposure mask.

[0039]The display according to claim 11 is manufactured using the exposure device according to any one of claims 1 to 3, the exposure mask according to any one of claims 4 to 6, or the exposure method according to any one of claims 7 to 10.

[0040]The electronic parts according to claim 12 are manufactured using the exposure device according to any one of claims 1 to 3, the exposure mask according to any one of claims 4 to 6, or the exposure method according to any one of claims 7 to 10.

[0041]

[Embodiment of the Invention]The top view for explaining the exposure mask (it is also only hereafter called a "mask") 201 concerning Embodiment 1 is shown in <Embodiment 1> drawing 1, and the top view for explaining the exposure method concerning a design and Embodiment 1 of the exposure mask 201 concerned is shown in drawing 2. In drawing 1, the dust 200 is illustrated for explanation. When the septum 7 of stripe shape (pattern in which two or more band-like patterns were located in a line for Sadakata) is formed as an example here, And the case where the photosensitive material (for example, dry film resist (it is also only hereafter called "resist") 60) of an exposure object is a negative mold shall be explained, and the top view of the back substrate 51R after developing the dry film resist 60 in the process of forming the septum 7 is shown in drawing 2. At this time, the resist 60 after development is formed in stripe shape corresponding to the pattern of the septum 7. The composition which comprises the substratum substrate 51Q, the glass paste layer 7A, and the resist 60 will be called "the exposure object board 300" (refer to below-mentioned drawing 4).

[0042]As shown in drawing 1, the mask pattern of the exposure mask 201 contains the translucent part (portion currently illustrated white) 201a which can penetrate exposing light, and the shade part (portion currently illustrated black) 201b which shades exposing light. Generally, although it may have a pattern for an exposure mask to form an alignment mark and a proximity gap mark (not shown), in order to explain simply, they will not be included in a "mask pattern" here. The translucent part 201a is carrying out stripe shape (two or more band-like patterns are located in a line for Sadakata). Especially the mask pattern of the mask 201 concerned is equivalent to some prescribed patterns (here stripe shape) 60A of the dry film resist 60 which should be made to remain after exposure development (on a design). Since the dry film resist 60 is a negative mold as mentioned above here, specifically, the pattern of the translucent part 201a of the mask 201 corresponds only to the above 60A part. And the exposure mask 201 has a mask pattern which can be exposed to the above-mentioned prescribed pattern for the resist 60 by changing the overlapped position in the plane view of the mask pattern of the exposure mask 201 concerned, and the exposure object board 300, and carrying out multiple-times operation of the exposure. At this time, with the exposure mask 201, some prescribed patterns 60A are selected so that exposure shape may continue between the above 60A (if it puts in another way translucent part 201a of the mask 201) of the prescribed pattern of the resist 60 part, and the remaining other parts 60B.

[0043]In detail about the pattern (design pattern) of the exposed part of the resist 60 corresponding to the designed pattern of the septum 7. Express the width and length of each band-like pattern as Wd and Ld, express the pitch of a band-like pattern as Pd, and express the number of band-like patterns as Nd, and. About the pattern of the translucent part 201a of the exposure mask 201, the width and length of each band-like pattern are expressed as Wm1 and Lm1, If the pitch of a band-like pattern is expressed as Pm1, the number of band-like patterns is expressed as Nm1 and the difference in dimension between the exposure mask 201 further produced depending on material or a process and the exposed part of the resist 60 is expressed as Wo, The mask pattern of the exposure mask 201 is designed satisfy formula (5) - (8).

[0044]

$$Wm1=Wd+Wo \quad -- (5)$$

$$Lm1=Ld+Wo-Ls1 \quad -- (6)$$

$$Pm1=Pd \quad -- (7)$$

$$Nm1=Nd \quad -- (8)$$

That is, as for length Lm1 of each band-like pattern of the translucent part 201a of the mask 201, only profile size Ls1 (<Lm1) is shorter than the length Ld of each band-like pattern of the resist 60 after exposure development (the size Wo presupposes that it is smaller enough than size Ls1). For this reason, the resist 60 can be exposed to predetermined stripe shape by shifting relatively to the extending direction (or elongation direction) of the band-like pattern of the translucent part 201a the exposure mask 201 and the exposure object board 300, and exposing multiple times (the sum total to shift is size Ls1). According to this exposure method, the resist 60 can be exposed so that exposure shape may continue between the above 60A of the prescribed pattern of the resist 60 part, and the remaining other parts 60B.

[0045]Next, referring to the top view of the sectional view (side view) of drawing 3 - drawing 6, drawing 8 and drawing 10 - drawing 12, drawing 7, and drawing 9, formation of the septum 7 is mentioned as an example and the exposure method using the exposure mask 201 is explained. Drawing 3 - drawing 6, drawing 8 and drawing 10 - drawing 12 are equivalent to the sectional view (side view) in the I-I line in drawing 2. Although the same size is illustrating the exposure mask 201 and the substratum substrate 51Q in drawing 6 - drawing 9 for explanation, the shade part 201b of the mask 201 has fully spread in the periphery.

[0046]First, the substratum substrate 51Q is prepared with a general manufacturing method (refer to drawing 3 and drawing 25), and as shown in drawing 4, the layer 7A of the glass paste which is the material of a septum is extensively formed by the coat method, print processes, etc. on the substratum substrate 51Q. And as shown in drawing 5, the dry film resist 60 (here negative mold) which is a photosensitive material is formed by the laminating method by a laminating machine, etc. on the glass paste layer 7A.

[0047]The alignment mark and the proximity gap mark (not shown) are provided in the edge part of the principal surface (for example, principal surface of the rear glass substrate 9) of the exposure object board 300.

[0048]Next, as shown in drawing 6 and drawing 7, make the exposure mask 201 and the exposure object board 300 meet, and a relative position is adjusted (aligning), Then, exposure transfer of the pattern of the mask 201 is collectively carried out to the dry film resist 60 by exposing the resist 60 via the mask

201. Next, as shown in drawing 8 and drawing 9, the relative position of the exposure mask 201 and the exposure object board 300 is adjusted again, and 2nd exposure is performed. When adjusting the 2nd relative position especially, specified quantity (in step) change of the overlapped position in the plane view (refer to drawing 9) of the mask pattern of the exposure mask 201 and the exposure object board 300 is carried out so that the mask pattern of the exposure mask 201 may lap with a part of exposed portion in previous exposure. Specifically, By moving the exposure mask 201 or/and the exposure object board 300 so that the exposure mask 201 and the exposure object board 300 may become the physical relationship from which only size Ls1 shifted to the extending direction of the band-like pattern of the translucent part 201a of the mask 201 to the relative position at the time of the exposure which is the 1st time, An above-mentioned overlapped position is changed.

[0049]Thus, in this exposure method, the resist 60 is exposed to a prescribed pattern (refer to drawing 2) by exposing twice using the single exposure mask 201. The resist 60 after all of these two exposure are completed, It is divided into the portion 61 with which exposing light was irradiated once, the portion 62 with which exposing light was irradiated twice, and the portion 63 which was not exposed, and according to this exposure method, in the resist 60 concerned, the portion 61 with which exposing light was irradiated once, and the portion 62 by which the multiple-times (2 times) exposure was carried out are intermingled.

[0050]Although above-mentioned explanation described the case where the amount of laps of the mask pattern of the mask 201 and the exposure object board 300 was changed by 1 size Ls at once, The amount of laps concerned may be divided into multiple times, and it may be made to change in step, and may expose for every overlapping state (moreover, the variation of the lap in each time may differ). At this time, the amount of exposing light is set up so that sufficient photopolymerization for the resist 60 may arise by at least one exposing light exposure. For example, the 1st amount of exposing light at the time of exposure of the last round is set as the quantity in which photopolymerization is possible enough, and the amount of exposing light of the other time may be set to less than it. Or the amount of exposing light at the time of each exposure may be set up so that photopolymerization sufficient as a result by which multiple-times exposure was carried out may arise to the portion by which multiple-times exposure is carried out. Or the amount of exposing light at the time of each exposure from the 1st time to the last round may be arbitrarily set up within limits which sufficient photopolymerization reaction may produce, for example, respectively.

[0051]Next, the portions 61 and 62 exposed while the portion 63 which was not exposed among the resist 60 dissolved in the developing solution, when the resist 60 was developed are formed as an exposure pattern, without dissolving in a developing solution (refer to drawing 10). Then, the glass paste layer 7A is formed in the pattern according to the exposure pattern of the dry film resist 60 by carrying out sandblasting, using as a mask the dry film resist 60 which remains after development (refer to drawing 11 and drawing 2). Then, the septum 7 is completed by exfoliating and calcinating the dry film resist 60 at an elevated temperature (refer to drawing 12).

[0052]When adjusting the relative position of the exposure mask 201 and the exposure object board 300, before changing the overlapped position of the mask pattern of the mask 201, and the exposure object board 300 -- the mask 201 and the exposure object board 300 -- keeping away (the interval (proximity gap) of the mask 201 and the exposure object board 300 is expanded). After changing the above-mentioned overlapped position, the mask 201 and the exposure object board 300 may be brought close,

and it may set up and adjust at a predetermined (reducing a proximity gap) proximity gap. According to this, when changing the overlapped position of the mask pattern of the mask 201, and the exposure object board 300, it can avoid certainly that the mask 201 and the exposure object board 300 contact.
[0053]In this exposure method, since the variation of the lap of the mask pattern of the mask 201 and the exposure object board 300 is set up beforehand, it is applicable to both alignment exposure and non alignment exposure. when the exposure mask 201 and the exposure object board 300 have an alignment mark at this time, and alignment exposure is possible namely,. To the step which adjusts the relative position of the exposure mask 201 and the exposure object board 300. After changing the overlapped position of the mask pattern of the mask 201, and the exposure object board 300, it is possible to include the step which carries out alignment of the mask 201 and the exposure object board 300 using the above-mentioned alignment mark. According to this, by the alignment using an alignment mark, after changing an overlapped position, 2nd exposure (2nd henceforth) can be performed with more exact accuracy of position.
[0054]Next, the block diagram of the exposure device 100 for realizing an above-mentioned exposure method is shown in drawing 13. In drawing 13, the exposure mask 201 and the exposure object board 300 are collectively illustrated for explanation.
[0055]The exposure device 100 is provided with the following.
Substrate stage 110.
Mask stage 109.
Exposure light source 108.
Control section 101.
In detail, the substrate stage 110 supports the exposure object board 300 with the dry film resist 60 by adsorption and fixation, and the mask stage 109 supports the exposure mask 201 by adsorption and fixation. The exposure light source 108 emits exposing light, and outgoing radiation of the exposing light from the light source 108 concerned is controlled by the control section 101 (control circuit 102 of the after-mentioned specifically). In drawing 13, graphic display-ization of the detailed optical system between the exposure light source 108 and the mask 201 is omitted.
[0056]The control section 101 is provided with the following.
Control circuit 102.
Stage controller 103.
Proximity gap sensor 104.
The microscope 105, the imaging camera (here CCD camera) 106, and the image processing device 107.

[0057]The control circuit 102 performs control of various kinds, such as sequence control (it mentions later) of the exposure device 100 whole, and a drive of the stage controller 103. The stage controller 103 drives the substrate stage 110 or/and the mask stage 109 to X, Y, and Z shaft orientations under control of the control circuit 102. The X-axis and a Y-axis are taken in the level surface here, and the Z-axis is taken at right angles to the X-axis and a Y-axis.
[0058]The proximity gap sensor 104 is measured optically, using the proximity gap mark in which the interval (proximity gap) of the mask 201 and the exposure object board 300 was provided by the mask 201 and the exposure object board 300, and outputs a measuring result to the control circuit 102. CCD camera 106 incorporates the alignment mark provided in the mask 201 and the exposure object board 300 via the microscope 105 as an optical image, and outputs the incorporated image to the control circuit

102. The control circuit 102 controls the focus of the microscope 105 and CCD camera 106.
[0059]As for the output from the image and the proximity gap sensor 104 which were incorporated by CCD camera 106, image processing etc. are carried out by the image processing device (for example, a personal computer is applicable) 107, and a processing result is outputted to the control circuit 102. Based on the processing result by the image processing device 107, the control circuit 102 controls the position of the substrate stage 110 or/and the mask stage 109 via the stage controller 103, and controls the relative position of the exposure object board 110 and the mask 201.
[0060]You may have composition which makes the control circuit 102 and the image processing device 107 serve a double purpose.
[0061]Next, operation of the exposure device 100 or the sequence control by the control section 101 (control circuit 102) is explained, referring to the flow chart (drawing 14 and drawing 15 are connected via the connectors A and B) of drawing 14 and drawing 15.
[0062]First, the exposure mask 201 is carried in to the position of the mask stage 109 (step ST1), the mask 201 is positioned (step (aligning) ST2), and the mask 201 is adsorbed to the mask stage 109 and fixed after that (step ST3). Next, the exposure object board (substratum substrate 51Q in which the glass paste 7A and the dry film resist 60 were formed) 300 is carried in on the substrate stage 110 (step ST4), Rough positioning is carried out for the exposure object board 300 by a pin etc. (step ST5), and the exposure object board 300 is adsorbed and fixed to the substrate stage 110 (step ST6). Next, Measuring the interval (proximity gap) of the exposure object board 300 and the mask 201 with the proximity gap sensor 104 by the Z direction drive of the substrate stage 110 or/and the mask stage 109. It is set as the predetermined proximity gap set up beforehand (Steps ST7-ST9).
[0063]Next, in carrying out alignment exposure, it adjusts the relative position in X of (Step ST10), and the exposure mask 201 and the exposure object board 300, and Y shaft orientations (Steps (it aligns) ST11-ST13). Specifically, So that it may enter in the acceptable value which picturized the alignment mark of the exposure object board 300 and the mask 201 and to which the amount of alignment gaps was beforehand set by CCD camera 106. Alignment control with the exposure object board 300 and the mask 201 is carried out by the XY direction drive of the substrate stage 110 or/and the mask stage 109 (Steps ST11-ST13). And operation of the exposure device 100 shifts to the following exposing step ST14. On the other hand, in carrying out non alignment exposure, operation of the exposure device 100 shifts to exposing step ST14, without carrying out the above-mentioned alignment steps ST11-ST13 (step ST10).
[0064]And exposure transfer of the pattern of the mask 201 is collectively carried out to the dry film resist 60 by exposing the resist 60 via the mask 201 with the light exposure set up beforehand (1st exposing step ST14). After the 1st exposure, the stage position of the substrate stage 110 or/and the mask stage 109 is controlled, and the relative position of the exposure mask 201 and the exposure object board 300 is adjusted again (step ST15). At this time, in relative-position adjustment step ST15 after exposure. As shown in the flow chart of drawing 16, by XY drive (step moving) of the substrate stage 110 or/and the mask stage 109. Specified quantity (in step) change of the overlapped position in the plane view (refer to drawing 9) of the exposure object board 300 and the mask pattern of the mask 201 is carried out so that the mask pattern of the exposure mask 201 may lap with a part of exposed portion in previous exposure as mentioned above (step ST152). Then, in alignment exposure, alignment control with the exposure object board 300 and the mask 201 is carried out like the above-mentioned steps ST11-ST13 (step ST154). So that an alignment mark may exist in the imaging range of the microscope 105

and CCD camera 106 after movement of the mask 201 or/and the exposure object board 300, Based on the move direction and movement magnitude of the mask 201 or/and the exposure object board 300, two or more alignment marks are provided in the mask 201 and the exposure object board 300. On the other hand, the alignment control concerned is not carried out in non alignment exposure.

[0065]In [as shown in the flow chart of drawing 17] relative-position adjustment step (or stage position control step) ST15 after exposure, Carry out proximity gap expansion control (step ST151) which keeps away the mask 201 and the exposure object board 300 before step ST152 to which the overlapped position of the mask pattern of the mask 201 and the exposure object board 300 is changed, and. Proximity gap reduction control which brings the mask 201 and the exposure object board 300 close after step ST152 to which the above-mentioned overlapped position is changed, and setting-out control (step ST153) to a predetermined value may be carried out. In alignment exposure, alignment control (step ST154) is carried out, after proximity-gap-reducing and setting up. So that a proximity gap mark may exist in the measuring range of the proximity gap sensor 104 after movement of the mask 201 or/ and the exposure object board 300, Based on the move direction and movement magnitude of the mask 201 or/and the exposure object board 300, two or more proximity gap marks are provided in the mask 201 and the exposure object board 300.

[0066]And 2nd exposure is carried out like the 1st time after step ST15 (step ST16). In performing exposure 3 times or more after that, The number of predetermined times repeats by turns the step (or control step of a stage position) which adjusts the relative position of the exposure mask 201 and the exposure object board 300 like the above-mentioned step ST15, and the same exposing step as the 1st time (Steps ST17-ST19).

[0067]The substrate stage 110 or/and the mask stage 109 are returned to an initial position after exposure of a last round eye (step ST20), adsorption and fixation of the exposure object board 300 are canceled (step ST21), and the exposure object board 300 is taken out (step ST22). If there is a substrate exposed continuously (step ST23), from above-mentioned substrate carrying-in step ST4 to substrate taking-out step ST22 will be performed repeatedly.

[0068]Thus, in the exposure device 100 by control of the control section 101 (control circuit 102). The exposure control (step ST14, ST16, ST18, ST19) which carries out one-shot exposure transfer of the mask pattern of the exposure mask 201 according to the exposure light source 108 at the resist 60, Stage position control (step ST15, ST17) of the mask stage 109 after exposure control or/and the substrate stage 110 is carried out one by one, and exposure control is carried out twice [at least]. As mentioned above, stage position control the overlapped position in the plane view of the mask pattern of the exposure mask 201, and the exposure object board 300 so that the mask pattern of the exposure mask 201 may lap with a part of exposed portion in previous exposure The specified quantity, The lap control (step ST152) to change is included.

[0069]According to the exposure mask 201 applicable to an above-mentioned exposure method, the exposure device 100, and these, after changing the overlapped position in the plane view of the mask pattern of the exposure mask 201, and the exposure object board 300, it exposes again.For this reason, although it should expose essentially, it is possible to expose the portion (see the unexposed portion 63 near the center of the resist 60 in drawing 6) which serves as unexposed by the dust 200 grade adhering to an exposure mask by exposure control for the second time (refer to drawing 8). Therefore, the pattern defect of the resist 60 can be reduced or abolished. As a result, productive efficiency and the yield can be raised as compared with the above-mentioned conventional one-shot exposure method. The

contamination control of an exposure mask can be eased. Since the necessity that adhesion of the dust 200 discards owing to is lost, the life of an exposure mask can be lengthened.

[0070]Since multiple times are exposed using the single exposure mask 201 according to an above-mentioned exposure method and the exposure device 100, a throughput higher than the case where multiple times are exposed using two or more exposure masks as stated above is realizable. the specified quantity which set up beforehand the overlapped position in the plane view of the mask pattern of the exposure mask 201, and the exposure object board 300 -- since it is made to change, the exposure device concerned can respond to both alignment exposure and non alignment exposure, and its flexibility is high.

[0071]According to [these results] the exposure mask 201 applicable to an above-mentioned exposure method, the exposure device 100, and these, a display can be cheaply provided by improvement in the yield, reduction of a manufacturing cost, etc.

[0072]The top view for explaining the exposure mask 202 concerning Embodiment 2 is shown in <Embodiment 2> drawing 18, and the top view for explaining the design of the exposure mask 202 concerned to drawing 19 is shown. The dust 200 is illustrated in drawing 18 for explanation. Also in Embodiment 2, the septum 7 and the dry film resist 60 of a negative mold are mentioned as an example, and are explained. For this reason, to drawing 19, the back substrate 51R after developing the dry film resist 60 in the process of forming the septum 7 is illustrated like drawing 2.

[0073]The mask pattern of the exposure mask 202 as well as the exposure mask 201 of drawing 1 contains the translucent part 201a of stripe shape, and the shade part 201b. And the mask pattern (here pattern of the translucent part 201a) of the mask 202 concerned is equivalent to some prescribed patterns (here stripe shape) 60C of the dry film resist 60 which should be made to remain after exposure development (on a design). Especially about the exposure mask 202, the above 60C of the prescribed pattern concerned part, It is selected from the resist 60 after 2 or more and exposure including the band-like pattern of a small (if it puts in another way, it is less than the septum 7) number among two or more band-like patterns (here, each band-like pattern hits a unit pattern) which accomplish the resist 60 of the stripe shape after development (on a design). Corresponding to this, the remaining other parts 60D of the prescribed pattern of the resist 60 are selected so that at least one band-like pattern in the resist (on a design) 60 after development may be included (in drawing 19, the case where the other parts 60D contain one band-like pattern is illustrated).

[0074]If the width and length of each band-like pattern are expressed as Wm2 and Lm2, the pitch of a band-like pattern is expressed as Pm2 about the pattern of the translucent part 201a of the exposure mask 202 in detail and the number of band-like patterns is expressed as Nm2, The mask pattern of the exposure mask 202 is designed satisfy formula (9) - (12).

[0075]

$$Wm2=Wd+Wo \quad -- (9)$$

$$Lm2=Ld+Wo \quad -- (10)$$

$$Pm2=Pd \quad -- (11)$$

$$Nm2=Nd-Ls2/Pd \quad -- (12)$$

several Nm2 of the band-like pattern of the translucent part 201a of the mask 202 -- several [of the band-like pattern of the resist 60 after exposure development (if it puts in another way septum 7)], since it is less than Nd, As shown in the top view of drawing 20 and drawing 21, The exposure mask 202 and the

exposure object board 300 are shifted by two units of size Pm relatively to the arrangement direction of the band-like pattern of the translucent part 201a (thereby (the sum total to shift is size Ls2).). The resist 60 can be exposed to predetermined stripe shape by changing the overlapped position of the mask pattern of the exposure mask 202, and the exposure object board 300, and exposing multiple times. Here, size Ls2 hits pitch Pd of a band-like pattern, and the multiple of Pm2.

[0076]According to the exposure mask 202, it is also possible to pile up the mask 202 and the exposure object board 300 on plane view so that the translucent part 201a to which the dust 200 has adhered as shown in drawing 22 may not meet the resist 60.

[0077]The exposure mask 202 can be used like the exposure mask 201 as stated above, and does so the same effect as the exposure mask 201.

[0078]The exposure mask 201,202 may be combined. Specifically in the exposure mask 201, the number of band-like patterns may be set up like the exposure mask 202. The same effect is acquired also with such an exposure mask.

[0079]By the way, it is also possible to realize the part (for example, 2) of two or more band-like patterns which constitute stripe shape to be one unit pattern, formation of the write-in electrode 6 is mentioned as an example, and the case where the next is started is explained.

[0080]The top view for explaining other exposure masks 203 concerning Embodiment 2 is shown in drawing 23, and the top view for explaining the design of the exposure mask 203 concerned to drawing 24 is shown. The dust 200 is illustrated in drawing 23 for explanation.

[0081]In formation of the write-in electrode 6, the composition which comprises the conductive paste 6A and the dry film resist 60 which are the material of the write-in electrode 6 laminated in this order on the rear glass substrate 9 and the substrate 9 concerned hits an "exposure object board." The case where the dry film resist 60 is a negative mold also here is mentioned as an example, and the back substrate 51R after developing the dry film resist 60 in the process of forming the write-in electrode 6 is illustrated to drawing 24 like drawing 2.

[0082]As shown in drawing 24, two or more (here five pieces) unit patterns in which the resist pattern for write-in electrode 6 (if it puts in another way write-in electrode pattern) comprises two or more band-like patterns (here 5) are repeatedly located in a line.

[0083]At this time, the mask pattern (here pattern of the translucent part 201a) of the exposure mask 203 for forming the write-in electrode 6 is equivalent to some prescribed patterns 60E of the dry film resist 60 which should be made to remain after exposure development (on a design). In the exposure mask 203, especially the above 60E of the prescribed pattern part is selected from the resist 60 after two or more and exposure including a small number of unit patterns among two or more unit patterns which accomplish the resist (on a design) 60 after development. Corresponding to this, the remaining other parts 60F of the prescribed pattern of the resist 60 are selected so that at least one unit pattern in the resist (on a design) 60 after development may be included (in drawing 24, the case where the other parts 60F contain one unit pattern is illustrated).

[0084]In detail about the pattern (design pattern) of the exposed part of the resist 60 corresponding to the designed pattern of the write-in electrode 6. Express the width and length of each band-like pattern as Wd3 and Ld3, express the pitch of a band-like pattern as Pd3, express the number of band-like patterns as Nd3, and express the pitch and the number of arrangement of a unit pattern as Pd3U and Nd3U, and. About the pattern of the translucent part 201a of the exposure mask 203, the width and length of each

band-like pattern are expressed as Wm3 and Lm3, If the pitch of a band-like pattern is expressed as Pm3, the number of band-like patterns is expressed as Nm3 and the pitch and the number of arrangement of a unit pattern are expressed as Pm3U and Nm3U, the mask pattern of the exposure mask 203 is designed satisfy formula (13) - (18).

[0085]

Wm3=Wd3+Wo -- (13)

Lm3=Ld3+Wo -- (14)

Pm3=Pd3 -- (15)

Nm3=Nd3-Ls3/Pd3 -- (16)

Pm3 U=Pd 3U -- (17)

Nm3U=Nd3U-Ls3/Pd3U -- (18)

several [of the unit pattern of the translucent part 201a of the mask 203] -- Nm3U -- several [of the unit pattern of the resist 60 after exposure development (if it puts in another way write-in electrode 6)], since it is less than Nd3U, As shown in drawing 24, The exposure mask 203 and the exposure object board 300 are shifted by three units of size Pm relatively to the arrangement direction of the unit pattern of the translucent part 201a (thereby (the sum total to shift is Ls3).). The resist 60 can be exposed to a predetermined pattern by changing the overlapped position of the mask pattern of the exposure mask 203, and the exposure object board 300, and exposing multiple times. Here, size Ls3 hits the multiple of pitch Pd3U of a unit pattern, and Pm3U.

[0086]The exposure mask 203 can be used like the exposure mask 201,202 as stated above, and does so the same effect as the exposure mask 201,202.

[0087]It is also possible to use the exposure mask 201P which has a prescribed pattern (on a design) after the development of the resist 60 and the same mask pattern, for example, the conventional exposure mask, like the exposure mask 202,203. That is, it is also possible to shift relatively to the arrangement direction of a unit pattern the conventional exposure mask 201P and exposure object board, and to expose them, for example.

[0088]Although the <modification of Embodiments 1 and 2> above-mentioned explanation described the case where the dry film resist 60 was used, paste state resist (photosensitive material) may be applied, for example. If photosensitivity is given to the glass paste 7A for septum 7, and the conductive paste 6A for write-in electrode 6, resist of dry-film-resist 60 grade can be made unnecessary. In this case, the glass paste 7A and the conductive paste 6A with photosensitivity hit a "photosensitive material", The composition which comprises the conductive paste 6A and the rear glass substrate 9 with the composition and the photosensitivity which comprise the glass paste 7A and the substratum substrate 51Q with photosensitivity hits an "exposure object board", respectively. It cannot be overemphasized that a photosensitive material is not restricted to a negative mold.

[0089]The glass paste 7A and the conductive paste 6A may be patterned by methods other than sandblasting (etching). Also when the plane pattern of the septum 7 has the shape for example, of a lattice, above-mentioned explanation is applied and is not restricted to band-like about the write-in electrode 6.

[0090]Besides dust 200, also when the pattern defect of for example, the exposure mask itself causes the unexposed pattern defect of the resist 60, above-mentioned explanation is appropriate.

[0091]In addition, the exposure method, the exposure device 100, and the exposure masks 201-203 concerning Embodiments 1 and 2 are applicable to the exposure process of electronic parts, such as

displays (for example, liquid crystal) other than PDP, and a semiconductor device, etc.
[0092]
[Effect of the Invention]According to the invention concerning claim 1, the exposure device operates an order of exposure control -> stage position control -> exposure control, namely, after changing the overlapped position in the plane view of the mask pattern of an exposure mask, and an exposure object board, it performs exposure control again. For this reason, although it should expose essentially, it is possible to expose the portion which serves as unexposed with the dust adhering to an exposure mask, etc. by exposure control for the second time. Therefore, the pattern defect of a photosensitive material can be reduced or abolished. As a result, productive efficiency and the yield can be raised, further, the contamination control of an exposure mask can be eased and the life of an exposure mask can be lengthened.Since multiple times are exposed using a single exposure mask, a throughput higher than the case where multiple times are exposed using two or more exposure masks is realizable. the overlapped position in the plane view of the mask pattern of an exposure mask, and an exposure object board -- the specified quantity -- since it is made to change, the exposure device concerned can respond to both alignment exposure and non alignment exposure.
[0093]According to the invention concerning claim 2, it is avoidable that an exposure mask and an exposure object board contact in the case of lap control.
[0094]According to the invention concerning claim 3, after lap control, it can expose with more exact accuracy of position.
[0095]According to the invention concerning claim 4, a photosensitive material can be exposed to a prescribed pattern by changing the overlapped position in the plane view of the mask pattern of an exposure mask, and an exposure object board, and carrying out multiple-times operation of the exposure. For this reason, although it should expose essentially, it is possible to expose the portion which serves as unexposed with the dust adhering to an exposure mask, etc. by exposure for the second time. Therefore, the pattern defect of a photosensitive material can be reduced or abolished. As a result, productive efficiency and the yield can be raised, further, the contamination control of an exposure mask can be eased and the life of an exposure mask can be lengthened.
[0096]According to the invention concerning claim 5, an example of the exposure mask which can expose a photosensitive material to a prescribed pattern can be provided by changing the overlapped position of the mask pattern of an exposure mask and exposure object board in plane view, and carrying out multiple-times operation of the exposure.
[0097]According to the invention concerning claim 6, other examples of the exposure mask which can expose a photosensitive material to a prescribed pattern can be provided by changing the overlapped position of the mask pattern of an exposure mask and exposure object board in plane view, and carrying out multiple-times operation of the exposure.
[0098]According to the invention concerning claim 7, an order of an exposing step (a) -> relative-position adjustment step (b) -> exposing step (a) is operated, namely, after changing the overlapped position in the plane view of the mask pattern of an exposure mask, and an exposure object board, it exposes again. For this reason, although it should expose essentially, it is possible to expose the portion which serves as unexposed with the dust adhering to an exposure mask, etc. at the time of exposure for the second time. Therefore, the pattern defect of a photosensitive material can be reduced or abolished. As a result, productive efficiency and the yield can be raised, further, the contamination control of an exposure mask can be eased and the life of an exposure mask can be lengthened. Since multiple times

are exposed using a single exposure mask, a throughput higher than the case where multiple times are exposed using two or more exposure masks is realizable. the overlapped position in the plane view of the mask pattern of an exposure mask, and an exposure object board -- the specified quantity -- since it is made to change, the exposure method concerned can respond to both alignment exposure and non alignment exposure.

[0099]According to the invention concerning claim 8, when changing an overlapped position, it can avoid that an exposure mask and an exposure object board contact.

[0100]According to the invention concerning claim 9, after changing an overlapped position, it can expose with more exact accuracy of position.

[0101]According to the invention concerning claim 10, an example of an exposure mask applicable to the exposure method concerned can be provided.

[0102]According to the invention concerning claim 11, a cheap display can be provided by improvement in the yield, reduction of a manufacturing cost, etc.

[0103]According to the invention concerning claim 12, cheap electronic parts can be provided by improvement in the yield, reduction of a manufacturing cost, etc.

[Translation done.]

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1]An exposure device comprising:
A substrate stage which supports an exposure object board which has a photosensitive material.
A mask stage which supports an exposure mask.
An exposure light source.
A control section which outgoing radiation of exposing light from said exposure light source is controlled, and controls a position of said mask stage or/and said substrate stage, and controls a relative position of said exposure mask and said exposure object board, Exposure control to which a preparation and said control section carry out one-shot exposure transfer of the mask pattern of said exposure mask according to said exposure light source at said photosensitive material, Carry out stage position control which adjusts a relative position of said exposure mask and said exposure object board one by one, and carry out said exposure control twice [at least], and said stage position control, They are the specified quantity and the lap control to change about an overlapped position in plane view of said mask pattern of said exposure mask, and said exposure object board so that said mask pattern of said exposure mask may lap with a part of exposed portion in said previous exposure control.

[Claim 2]Are the exposure device according to claim 1, and said stage position control, An exposure device which includes further proximity gap expansion control which keeps away said exposure mask and said exposure object board before said lap control, and proximity gap reduction control which brings said exposure mask and said exposure object board close after said lap control.
[Claim 3]An exposure device which includes further alignment control to which it is the exposure device according to claim 1 or 2, and said stage position control carries out alignment of said exposure mask and said exposure object board after said lap control.
[Claim 4]It is an exposure mask for exposing a photosensitive material which an exposure object board has to a prescribed pattern, It has a mask pattern corresponding to said some of prescribed patterns, An exposure mask which is a pattern which can be exposed to said prescribed pattern about said photosensitive material by said mask pattern's changing an overlapped position in plane view of mask pattern concerned and said exposure object board, and carrying out multiple-times operation of the exposure.
[Claim 5]An exposure mask in which it is the exposure mask according to claim 4, and said some of said prescribed patterns are selected so that exposure shape may continue between said some of said

prescribed patterns and the remaining other parts.
[Claim 6]An exposure mask in which it is the exposure mask according to claim 4 or 5, said prescribed pattern contains a unit pattern of a predetermined number arranged repeatedly, and said some of said prescribed patterns contain a unit pattern of two or more and less than said predetermined number among said two or more unit patterns.
[Claim 7]An exposure method which exposes a photosensitive material which an exposure object board has to a prescribed pattern using an exposure mask, comprising:
(a) A step which carries out one-shot exposure transfer of the mask pattern of said exposure mask at said photosensitive material.
(b) A step which adjusts a relative position of said exposure mask and said exposure object board.
Carry out a preparation, said step (a), and said step (b) one by one, and carry out said step (a) twice [at least], and said step (b), (b)-1) They are the specified quantity and a step to change about an overlapped position in plane view of said mask pattern of said exposure mask, and said exposure object board so that said mask pattern of said exposure mask may lap with a part of exposed portion at said previous step (a).

[Claim 8]Are the exposure method according to claim 7, and said step (b), (b)-2) a step which keeps away said exposure mask and said exposure object board before said step (b)-1, and (b)-3 -- an exposure method which contains further a step which brings said exposure mask and said exposure object board close after said step (b)-1.
[Claim 9]it is the exposure method according to claim 7 or 8 -- said step (b) -- (b)-4 -- an exposure method which contains further a step which carries out alignment of said exposure mask and said exposure object board after said step (b)-1.
[Claim 10]An exposure method are the exposure method according to any one of claims 7 to 9, and using the exposure mask according to any one of claims 4 to 6 as said exposure mask.
[Claim 11]A display manufactured using the exposure device according to any one of claims 1 to 3, the exposure mask according to any one of claims 4 to 6, or the exposure method according to any one of claims 7 to 10.
[Claim 12]Electronic parts manufactured using the exposure device according to any one of claims 1 to 3, the exposure mask according to any one of claims 4 to 6, or the exposure method according to any one of claims 7 to 10.

[Translation done.]